WHAT IS CLAIMED IS:

1. Apparatus for identifying a plurality of items each of which has a radio frequency transponder, which apparatus comprises:

a conveyor for conveying the items;

a three dimensional radio frequency antenna positioned on one side of the conveyor, the conveyor having a movable part for moving the items into and out of the antenna such that the items when in the conveyor are completely surrounded by the antenna; and

a reader for sending interrogation signals to the transponders via the antenna and for reading identification information from the transponders.

2. The apparatus in accordance with claim 1, wherein the three dimensional antenna comprises a plurality of coils mounted in a three dimensional arrangement such as to provide a three dimensional reading field in which all transponders in the reading field may be interrogated.

3. The apparatus in accordance with claim 2, wherein the coils defining the reading field are interrogated sequentially until all transponders are identified.

4. The apparatus in accordance with claim 3, wherein after a transponder is identified it is placed in a quiet mode to prevent that same transponder from responding to interrogation signals from the antenna.

5. The apparatus in accordance with claim 2, wherein the antenna has at least two coils having a 180° phase shift between their magnetic fields, the coils being structured and arranged in such a way as to reduce undesired electromagnetic noise from affecting the reading field.

6. The apparatus in accordance with claim 2, wherein the antenna has at least two coils having a 180° phase shift between their magnetic field, the coils being structured and arranged in such a way as to minimize electromagnetic radiation emitted outside of the antenna.

7. The apparatus in accordance with claim 2, in which the antenna includes compensation coils with magnetic fields having a 180° phase shift positioned at the external limits of the reading area such that the magnetic fields outside of the reading area are insufficient to interrogate and read transponders outside the reading field.

8. The apparatus in accordance with claim 1, wherein the radio frequency transponder comprises:

a housing;

a substrate within the housing;

a printed circuit board mounted on the substrate;

a coil mounted on the substrate such as to be spaced therefrom; and

an encapsulant encapsulating the substrate, the printed circuit board, the integrated circuit chip and the coil, the spacing of the coil from the substrate enabling the encapsulate to completely surround the coil.

9. The apparatus according to claim 8, wherein the coil is spaced from the substrate by a plurality of spacer elements extending between the substrate and the coil.

10. The apparatus according to claim 1, wherein the three dimensional radio frequency antenna comprises:

a plurality of cylindrical antenna coils arranged within one another in a nested relationship, some of the coils being wound such that horizontal magnetic fields

phase shift at 180° and 90° may be generated, and others of the coils being wound such that vertical magnetic fields with phase shifts of 180° may be developed;

the plurality of cylindrical antenna coils being further arranged such that a three dimensional reading area is developed and noise compensation areas are developed at opposite ends of the reading area.

11. The apparatus according to claim 10, wherein each coil has turns with unequal spacing between them so that the magnetic field developed by the coil is homogeneous.

12. The apparatus according to claim 10, wherein the coils are wound about respective axes and the distance between turns of the coils increase when approaching the respective axis.

13. A radio frequency transponder comprises:

a housing

a substrate within the housing;

a printed circuit board mounted on the substrate;

a coil mounted on the substrate such as to be spaced therefrom; and

an encapsulant encapsulating the substrate, the printed circuit board, the integrated circuit chip and the coil, the spacing of the coil from the substrate enabling the encapsulate to completely surround the coil.

14. The transponder according to claim 13, wherein the coil is spaced from the substrate by a plurality of spacer elements extending between the substrate and the coil.

15. A three dimensional radio frequency antenna comprising:

a plurality of cylindrical antenna coils arranged within one another in a nested relationship, some of the coils being wound such that horizontal magnetic fields phase shift at 180° and 90° may be generated, and others of the coils being wound such that vertical magnetic fields with phase shifts of 180° may be developed;

the plurality of cylindrical antenna coils being further arranged such that a three dimensional reading area is developed and noise compensation areas are developed at opposite ends of the reading area.

16. The apparatus according to claim 18, wherein each coil has turns with unequal spacing between them so that the magnetic field developed by the coil is homogeneous.

17. The apparatus according to claim 15, wherein the coils are wound about respective axis and the distance between turns of the coils increase when approaching the respective axis.

18. The apparatus accordance with claim 15 wherein the plurality of coils mounted in a three dimensional arrangement such as to provide a three dimensional reading field in which all transponders in the reading field may be interrogated.

19. The apparatus in accordance with claim 18, wherein the coils defining the reading field are interrogated sequentially until all transponders are identified.

20. The apparatus in accordance with claim 18, wherein at least two of the coils have a 180° phase shift between their magnetic fields, the coils being structured and arranged in such a way as to reduce undesired elecromagnetic noise from affecting the reading field.

21. The apparatus in accordance with claim 18, wherein at least two coils have a 180° phase shift between their magnetic field, the coils being structured and arranged in such a way as to minimize electromagnetic radiation emitted outside the antenna.

22. The apparatus in accordance with claim 18, in which some of the coils are compensation coils with magnetic fields having 180° phase shift positioned at the external limits of the reading area such that the magnetic fields outside of the reading area are sufficient to interrogate and read transponders outside the reading field.